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ABSTRACT

The main themes of a seminar conceived as a working forum for people engaged in developing new methods for determining space requirements in education are summarized. After a brief introduction, the following topics are discussed: identification of the requirements for remodeling an existing educational facility, matching the provisions determined with this identified need, using the available resources in the most productive manner, and improving the intensity of use of these facilities. In the discussion of this process, all organizations and individuals are involved from the economic and social communities. The conclusions stress the need for all parts of the process to be taken into account to reach a coherent set of methods and procedures. References are included, and the following materials are appended: a summary of initial stages of a Norwegian research study assessing space requirements and use in educational buildings; a summary of recent work on area standards and the use of teaching space; and a list of documents presented with a select bibliography. (LMS)

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EDUCATIONAL SPACE REQUIREMENTS
AND THE EFFECTIVE USE OF BUILDINGS

Conclusions of a Seminar in Lysebu, Voksenkollen, Norway
20 - 23 MAY 1968

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ORGANISATION FOR ECONOMIC
CO-OPERATION AND DEVELOPMENT

Decentralised Programme on
Educational Building

GENERAL DISTRIBUTION

Paris, May 1988

EDUCATIONAL SPACE REQUIREMENTS AND THE EFFECTIVE USE OF RESOURCES

Conclusions of a Seminar in Lysebu, Voksenkollen, Norway
20 - 23 May 1986

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The seminar on Educational Space Requirements and the Effective Use of Resources, held in Lysebu, Voksenkollen, Norway, from 20th to 23rd May 1986, was organised jointly by the Norwegian Ministry of Church and Education and the Decentralised Programme on Educational Building (PEB). The choice of venue was prompted by the fact that Norway had at the time initiated a research study on how to make better use of areas and resources in school buildings. The final report on that study has just been published (1) and is referred to in the present paper as well as in the bibliography.

The seminar was conceived as a working forum for people directly engaged in the development of new methods and criteria for determining space requirements and space use in educational establishments for the 13-19 age group in both new and existing buildings. It brought together forty-three participants form fifteen OECD Member countries and provided an opportunity for central government and local authority officials, architects, educationists and research workers to exchange experiences on tools and techniques which enable needs to be analysed and evaluated, appropriate space provision determined, and effective use made of accommodation.

Due to circumstances beyond the control of the Secretariat, the production of the present paper has been considerably delayed. It was eventually prepared by Lizzie Gibson of the PEB Secretariat. The paper summarises the main themes of discussion at the seminar but also incorporates references to later work by the Programme. It should be regarded as the author's personal interpretation of the event rather than that of the organisers, the participants or the OECD. Nevertheless, the Secretariat believes that those who attended the seminar will find in it a fair reflection of the views which were expressed. The annexes include a summary of the initial stages of the Norwegian research study which served as the main background document for the seminar, a brief description of work done in this area in the United Kingdom and a list of the other documents circulated at the seminar.

It is hoped that the report will be of interest to all those who at different levels of responsibility are concerned with the provision and effective use of space for educational purposes.

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INTRODUCTION

In many OECD Member countries, the trend continues towards a redefinition of the last years of compulsory education (13 to 15 year olds) and of the objectives and content of post-compulsory education and training (16 to 19+ year olds). The variety of curriculum offerings and the diversity of activities to which they give rise increase with increasing age. Vocational courses are tending to have more general education content; purely academic programmes are more frequently related to the world of work.

In addition, post-compulsory participation rates are increasing, there is the continuing need to find adequate policy responses to youth and adult unemployment and a growing demand for retraining and up-dating of those in employment. As a result, the clientèle is changing and so is the nature of the demands put on the educational system. The changing balance between full-time and part-time education and training or between long and short courses, together with changing patterns of work and leisure time, will have a considerable impact on the kind of provision made.

Qualitative as well as quantitative aspects are thus involved and space and cost parameters need new definitions as demands change. Many were developed at a time of school population growth and were based on 'basic need', i.e. that of providing roofs over heads. Few are suited as a basis for new building, adaptation or remodelling projects to meet to-day's and tomorrow's needs.

Furthermore, a number of factors have in most countries combined to shift responsibility for the determination of educational space requirements away from the centre and closer to the users. Consequently, less emphasis is now placed on centrally determined norms and standards and greater emphasis is put on the need for detailed requirements to be determined in the light of local circumstances and considerations. Those responsible for the provision of appropriate educational buildings will increasingly be expected to base the assessment of need on the detailed analysis of changing educational requirements rather than by reference to traditional building provision.

It was against this background that participants in the PEB seminar on "Educational Space Requirements and the Effective Use of Resources" considered ways and means of determining need, matching provision to identified need and making more effective use of space. It dealt at some length with the concept of partnership, that is of the appropriate involvement of the various interests in the briefing and planning process, whether in terms of new building or the remodelling of the existing stock.

The principal conclusion was that most countries do in fact know very little about the space standards required to meet to-day's curriculum, even less that of tomorrow, and often use what accommodation they have most ineffectively. There was a general consensus about the need for further research in this area, for a continuous challenging of assumptions based on past patterns of provision and for the sustained exchange of experience within as well as between countries.

IDENTIFICATION OF NEED

Leaving aside the complex issue of forecasting future pupil and student numbers and their choice of options - these are in any case likely to change several times over in the course of the life-span of a building - the seminar preferred to focus on the kind of needs to be taken into account in any brief for the construction or remodelling of an educational establishment.

Needs can be considered under three broad subheads:

i) Needs that can be determined from a consideration of the curriculum, the staffing structure, the timetable, group sizes and the range of teaching/learning activities;

ii) Needs that arise from broader educational objectives and support of the curriculum activities, such as social and pastoral activities, individual study, library and other learning resources, provision for teaching and non-teaching staff, storage and circulation, and needs that can be met by outdoor provision;

iii) Needs that arise from the wider consideration of the establishment in relation to the educational and recreational needs of the community, links to other educational provision, social services, commerce and industry.

In considering need, the seminar felt that special attention should be paid to the intended organisation of teaching. It felt that the way in which the following questions are answered has a considerable effect on the determination of space requirements and on space use:

- Shall teaching continue to follow the traditional pattern of organisation by "subjects", "periods" and "rooms" or will greater emphasis be put on project-based learning and subject integration with a consequent need for greater flexibility in time-tabling and room scheduling?

- Shall theory and practice continue to be kept apart in time and in space or will provision be conceived to facilitate their integration?

- Shall the teaching organisation remain class-based or will it increasingly be founded on co-operation between teachers with consequent regroupings of classes requiring a greater variety in the size of teaching spaces?

- Shall the organisation of the school day, school week and school year remain the same or will it be changed to allow greater flexibility in work patterns while at the same time making more effective use of premises and equipment?

While we may be able to perceive general trends in pedagogical practice, we cannot know how the answers to these questions will affect individual buildings. Indeed, they will vary over the life-time of a building.

The fundamental question to be addressed was how to express space requirements in terms of two parameters - the activities undertaken and variations in group size - rather than by reference to established types of space.

Defining the nature of the activities to be considered (for examples of activities see Figure 1) can only be done in close co-operation with subject teachers and through observation of actual practice. Although the range of activities may be wide and may vary between teaching situations, such co-operation and observation will provide a far more useful insight into establishing a sensible brief than when, as has traditionally been the case, the class group or subject areas are taken as the point of departure for the brief.

This analysis will show that a number of the activities exemplified have similar space requirements or can be carried out in the same type of area. Some require less space than others but it would be wrong to conclude that as a result they are less relevant to the determination of space needs.

Figure 1 Examples of Activities

- Receptive activities
  - Listen
  - Observe
  - Read
- Reciprocal activities
  - Discuss, converse
  - Question, answer
- Study activities
  - Make notes
  - Write
  - Calculate
  - Look up in books
  - Work on computer
  - Work with wall maps, blackboard
  - Dissect
- Vocational activities
  - Lay bricks
  - Turn the lathe
  - Weld
  - Circuitry
  - Cut and shape metal
- Creative activities
  - Act, dance
  - Sing
  - Play instruments
  - Draw, paint
  - Construct
- Reporting activities
  - Present, demonstrate
  - Undergo examination (written, oral)
- Teacher activities
  - Prepare lessons or experiments
  - Correct examination papers
  - Tutor
  - Store equipment
- Sport activities
  - Play cricket
  - Gymnastics
  - Table tennis
- Social activities
  - Discuss with classmates
  - Wait
  - Play chess

Source: Based on the presentation of LINS project in Building Implications of the Multi-Option School, OECD/PEB, Paris 1975, p. 37.

Total space requirements will thus not be equal to the sum of individual activity areas. The analyses establishing the latter will show a considerable amount of overlap within and between subjects or courses. It will be necessary therefore to determine what activities are common and what spaces could be shared. To do so in a rational way demands a relationship analysis, i.e. the definition of proximity/distance requirements between departments, courses and activities. This is more fully described in section 6.3 of Annex A.

A second dimension to the definition of needs will result from consideration of variations in group size in relation to sequence of work. An illustration of what such variations might involve is shown in the diagram drawn from an earlier PEB report (2), reproduced here as Figure 2.

Finally, given the inevitable evolution of pedagogical practice, the kind of areas provided in schools must be capable of responding continuously over the life-time of a building to such change. To be able to accommodate changes in activities and in group sizes, it is necessary to provide a suitable mix of spaces, in other words to be able to cater for:

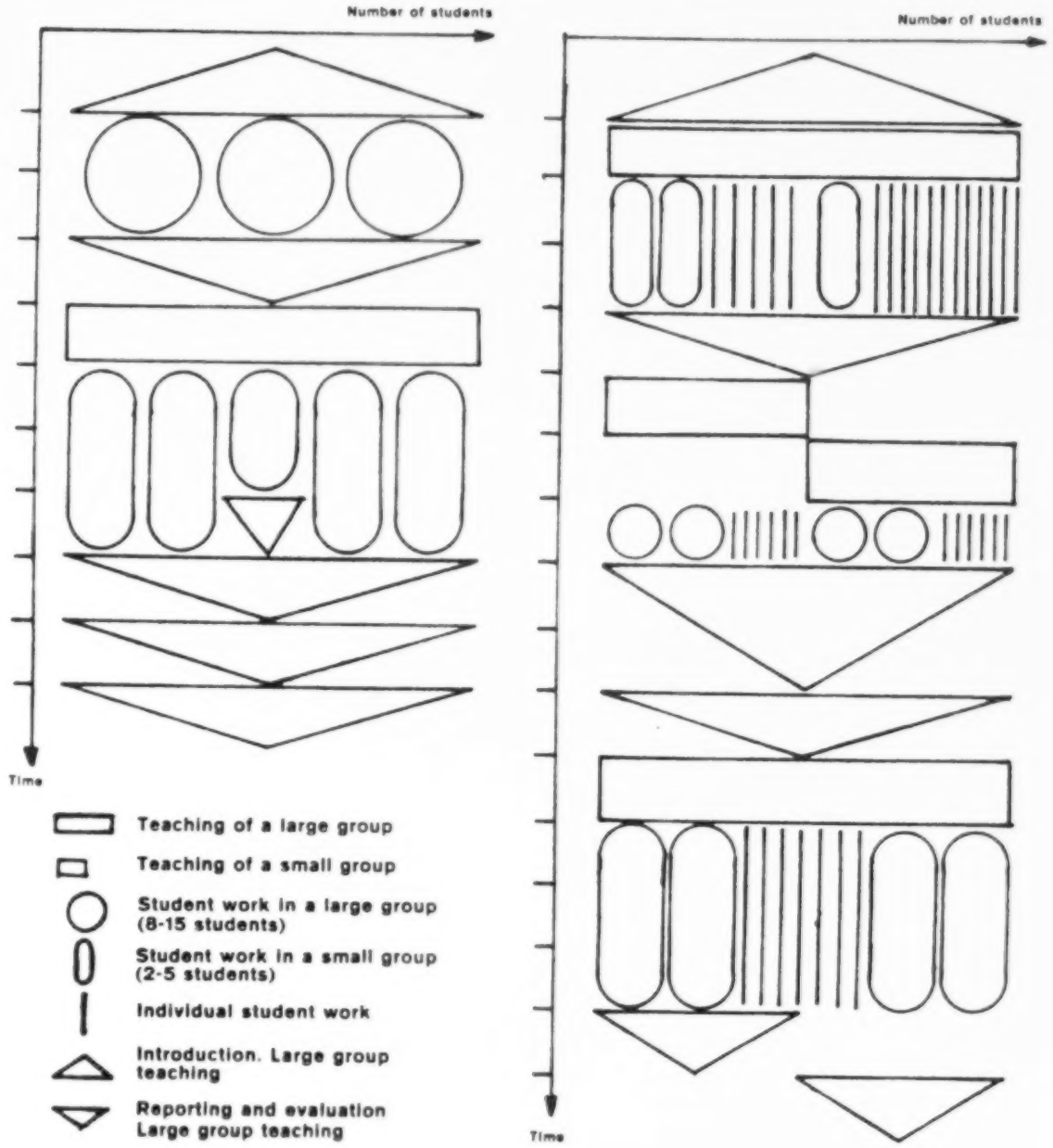
- large group teaching: introduction, lecturing, audio-visual presentation, reporting, evaluation (100-120);
- teaching of two class groups (50-60);
- teaching of one class group (25-30);
- student work in groups (12-15);
- student work in small groups (4-5);
- individual study.

MATCHING PROVISION TO IDENTIFIED NEED

Having considered how the needs of an educational establishment can be analysed and described in terms of activities and group sizes rather than by space type or courses, the next step is to develop the tools and techniques for translating activity need into space requirements, quantitative as well as qualitative.

The summary of the initial stages of the Norwegian research project on "Assessing Space Requirements and Space Use" presented at the seminar (Annex A) illustrates one very interesting approach, further elaborated in the final report just published (1). There was considerable support at the seminar for this type of research, although some fears were expressed about the time and costs involved in applying it on a large scale. In this context, it is suggested that a distinction should be made between the process adopted and the methods developed. While it is clear that every project, whether for a new building or the remodelling of an old one, can hardly form the object of such detailed investigation, everyone agreed that a number of pilot or development projects of this kind can help advance thinking and lead to a simplified set of criteria and methods which could be applied in each case.

Figure 2 Diagrammatic interpretation of variations in group size in relation to sequence of work
Two examples


Number of students
Time
Number of students
Time
Teaching of a large group
Teaching of a small group
Student work in a large group (8-15 students)
Student work in a small group (2-5 students)
Individual student work
Introduction. Large group teaching
Reporting and evaluation Large group teaching

Source : Based on S. Marklund, "The Role of the Teacher in Educational Innovation in Sweden," in The Teacher and Educational Change: A New Role, General Report, Vol. I, OCDE, Paris, 1974, page 312.

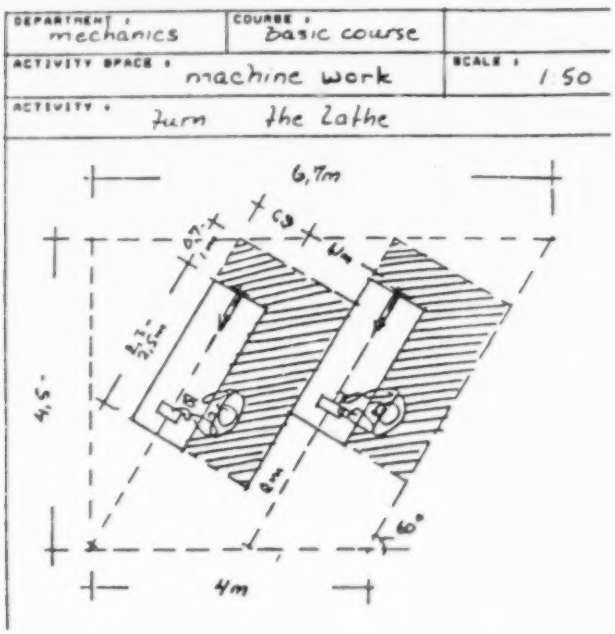
Note This type of diagram is also used by some teams of teachers in planning their work.

What seemed most important to participants was the way in which teachers' considerable experience could be brought to bear on the process of identifying and defining need and space requirements. Teachers like those responsible for school building have for too long been used to thinking in terms of rooms needed for specific curriculum areas, adding on such ancillary accommodation as seemed reasonable. With the analysis of activities as a basis, even the need for the latter will be more clearly defined and may get a fairer treatment than has often been the case in the past.

The Norwegian approach has shown that it is possible via a more refined analysis to get users, especially teachers, to take a new look at what they are doing, how the content is arranged and presented, how learning takes place, what the relationship between space and activity implies and what equipment and aids are actually required (see Figure 3). They also become more open to co-operation and to the idea of sharing space.

One point to which special attention needs to be given and to which there is no general answer, is how to strike an appropriate balance between the educational need to make a variety of space types available to a sector of the establishment or the curriculum and the economic advantages of grouping similar space types together. For example, should there be central or dispersed resource centres? separate or combined theoretical and practical areas?

Figure 3 Example of one space determining activity, scale drawing by teacher



Having established the size of individual activity areas, analysed overlaps and made the necessary regroupings to avoid overprovision, qualitative needs have to be assessed ensuring that environmental standards are appropriate for the various types of activity spaces provided and that health and safety regulations are adhered to. Furniture and equipment layouts form an important part of this stage of the process of matching provision to need.

It is important to bear in mind that the proposed activity analyses are not intended to produce rooms each tailor-made to a single activity. On the contrary, they are meant to show the potential for regroupings of activity spaces into broad categories providing the necessary variety both in terms of size and environmental quality. Specialist functions should be provided for by furniture, equipment and services that can be easily altered. This, together with designs which facilitate the 'multi-function' use of space will lead to less under-utilisation of specialised facilities. The latter is frequent in school buildings designed on the model of a string of classrooms of similar size coupled with a series of specialised spaces each earmarked for a special function.

Considerable time was devoted in some of the groups to discussing the concepts of adaptability and flexibility. It is worth noting here the distinction made in an earlier PEB report (3) between these two terms:

-- adaptability, the quality of a building which facilitates adaptation; adaptation may require relocation, replacement, removal or addition in respect of either the constructional elements, services or the finishes of the building - essentially large magnitude/low frequency change; and

-- flexibility, the quality of a building which permits variation in the activities, time-tabling, class size, etc., of a school without the need for adaptation as defined - essentially low magnitude/high frequency change.

An appropriate mix of spaces provides the necessary flexibility in the day-to-day matching of activities to spaces, whereas appropriate technical solutions in particular in terms of provision or ease of provision of services (e.g. for future cabling) makes it possible to change the function of a space without major building works.

In this context it is worth noting the consensus at the seminar that the open-plan or barn-type solution, often providing a uniform environment, was neither flexible nor adaptable. Likewise, it did not believe that the relocatability of partitions, advocated by many architects, represented a worthwhile investment; it is far cheaper to knock down a non load-bearing brick wall and build a new one elsewhere, if and as the need arises.

UTILISATION

In order to maximise the educational benefit from limited financial resources it is necessary not only to avoid duplication of provision but also to ensure that facilities are used as intensively as is possible and practicable.

Calculating the utilisation rate

The seminar noted with great interest the approach adopted in the Norwegian research study to establish a formula for assessing the utilisation rate of the various spaces making up a school building. Two factors determine the utilisation rate:

i) The density of occupation, i.e. the relationship between the number of pupils occupying a given space and the number for which that space is intended. For example, if a room is sufficiently large to receive 30 pupils but is only occupied by 25:

$$\text{the density of occupation} = \frac{25}{30} \times 100 = 83\%$$

Since the density of occupation may vary from lesson to lesson, it may be necessary to calculate for each space the average density of occupation over a week.

ii) The frequency of use, i.e. the relationship between the number of hours a week a given space is used and the maximum number of hours it would be considered feasible to use it. For example, if the maximum hours per week a room can be used is 40 and it is only used for 30 hours:

$$\text{the frequency of use} = \frac{30}{40} \times 100 = 75\%$$

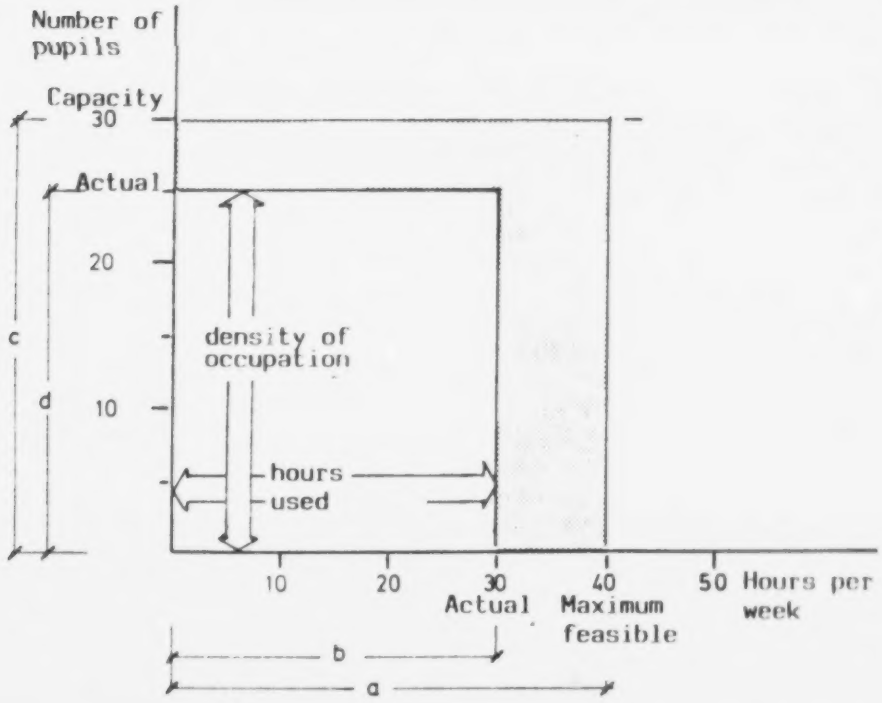
Consequently, the utilisation rate is the result of a combination of density of occupation and frequency of use.

Utilisation rate (%) = density of occupation (%) x frequency of use (%).

Figure 4 illustrates this in graphic form.

The setting of target utilisation rates needs to form part of any brief and it seems particularly important in situations of overcrowding, as in Greece, or of falling rolls, as in the United Kingdom. In both cases, but even in what seems a 'normal' situation, an evaluation of levels of space utilisation will show that there is a considerable potential for more effective use. The target to be set for a reasonable utilisation rate for individual spaces seems to lie in most countries somewhere between 70% to 80% but may vary slightly for different types of areas.

Figure 4 Utilisation rate expressed graphically



Frequency of use = the relationship $\frac{b}{a}$

Density of occupation = the relationship $\frac{d}{c}$

By multiplying $\frac{b}{a}$ by $\frac{d}{c}$ the utilisation rate obtained is the relationship between the small and the large rectangles in the Figure.

In the above example, the result is as follows:

Utilisation rate: 83% x 75% = 62%.

Source: Robert Solvang and Sigbjørn Strømmen, "Arealdata for skolebygg, ett analyseredskap". Skriftserie for yrkespedagogik, Publikasjon 29B, Statens Yrkespedagogiske Høgskole, Oslo.

Improving the utilisation rate

The crux seems often to be how to improve the levels of utilisation of the more expensive specialised facilities. Here again, the possibilities of sharing between establishments need to be further investigated. Consideration was given to this particular aspect in a symposium held in Segovia in December 1986(4). In addition, considerable advantages can be gained from changes in the organisation of the school day, school week and school year (5) or from a move towards more individualised learning based on modern information technology (6).

A recent Norwegian investigation into three neighbouring schools gave the following results. Two of the schools with a total teaching area of about 8 000 m^2 had a utilisation rate of only 53%. It became clear that following some re-organisation and adaptation, a 22% increase in efficiency would be feasible, i.e.

$$\frac{8\ 000 \times 22}{100} = 1\ 760\ m^2 \text{ now theoretically 'unused'}$$

At the third school which had claimed the need for an extension of 2 262 m^2 the investigation showed that the increase required was only 550 m^2 but to achieve that result a reallocation of spaces and some remodelling was needed. Considering, the annual savings on recurrent premises-related costs and the overall saving on capital costs, the investigation shows the order of magnitude of the economic but also educational advantages to be gained from the application of this kind of method for evaluating levels of space utilisation. In the latter school the reallocation resulted in improved working conditions for all departments. It should be added that the research workers estimated that the time spent on this investigation amounted to something between 30 and 50 man-days per school.

The interrelationship of user need, space requirements and levels of utilisation provide an appropriate field for the application of computer assisted analytical techniques to the design of new buildings and the evaluation and alternative use of existing buildings. One such example, the PAGODA, derived from the various area guidelines developed by the Department of Education and Science, London, is described in Annex B and was also demonstrated at the seminar. While the area guidelines and the PAGODA programme are easily applicable tools, they are more mechanical and less sophisticated than the Norwegian work. They are based on type of space corresponding to subject areas (general, science, commerce, drama, etc.) and not on an analysis of activities; they may therefore in their present form be less useful in a situation of changing educational requirements and demand.

It is evident however that no single method can meet both the criteria of simplicity and the need for more elaborate data to respond to local circumstances. Sometimes a quick first overview can help determine where it is worth taking a more detailed approach and it should be noted that this is the clearly stated objectives of the DES area guidelines and the PAGODA programme. Whatever method is used, it has to be used in a flexible manner and the objectives of the exercise and each step involved must be clearly spelt out.

Improved levels of space utilisation depend to a large extent on organisation and management and on the capacity of an educational establishment to adjust its facilities continually to meet new or changing educational needs. To be effective in this respect, each educational establishment would need to keep an up-to-date record of teaching and non-teaching spaces, of frequency of use and density of occupation. Only then can time-tabling be arranged in such a way as to eliminate the frequent mismatch between spaces and activities and avoid peaks and troughs in the use of individual spaces. An interesting example of time-tabling flexibility referred to at the seminar is that of upper secondary schools in Finland. Studies are organised in course modules, each subject being divided into units of 38 hours each. The time-table changes at the end of each module, as do the subjects studied.

A staggered school day will also considerably augment utilisation rates and reduce the overall need for accommodation. In existing buildings this will provide opportunities for reallocating space to meet new demands in particular for support areas (e.g. extended library and resource areas, individual study places, improved provision for teaching and non-teaching staff, more storage room) and for social areas (indoor as well as outdoor), increasingly important in the development of an environment conducive to learning.

While a different aspect of space utilisation, the use of school premises for the educational and recreational needs of the community needs to be given wider consideration. A long-standing tradition in the Nordic countries, well-developed in a series of specific projects in the United Kingdom (7), it is gradually but slowly being introduced in a number of countries such as Austria, France and the Netherlands. The organisational and management problems are not to be underestimated and it is important that the advantages outweigh the disadvantages. The revenue it brings to the school or the local authority needs to be such that it covers the extra costs involved as a result of increased wear and tear and permits improvements to be made to offset inconveniences.

It is inevitable that improved space utilisation will demand a change of attitude on the part of users. It can in fact be achieved only if the very strong sense of 'ownership' of users - this is 'my' laboratory, this is 'my' classroom - is gradually transformed into a sense of 'collective ownership', this is 'our common property'. Participants at the seminar continuously emphasized that for this to happen the users must be part and parcel of the process of change.

THE PROCESS

The changing nature of the process of evaluating educational need, determining appropriate space requirements, setting levels of utilisation and preparing planning proposals has been accompanied by a widening of the number and variety of organisations and individuals involved in the process. These range from central and/or local government elected representatives and officials, through educational and building specialists to teaching and non-teaching staff, parents, pupils and the wider community. Or as one group at the seminar put it: "The term 'user' should imply <u>all interested parties</u> in the community".

A first prerequisite for developing a more responsible attitude to building matters is that these are given greater overall attention by all concerned. There are economic reasons for this as well as educational and social. Despite this, it is symptomatic that educational policy makers in developing their reform proposals seldom refer to educational building as one of the essential resources for education.

Taking the example of a new building project, an upper secondary school with combined general and vocational education, the Norwegian research workers have calculated total annual costs and their distribution on different items. To give a true picture of building-related costs they have included not only premises-related recurrent costs and maintenance but also capital costs. In their calculations they have assumed a life-span of 40 years for the buildings

and 15 years for furniture and equipment, and annuities based on a 7 per cent interest rate. (See Figure 5).

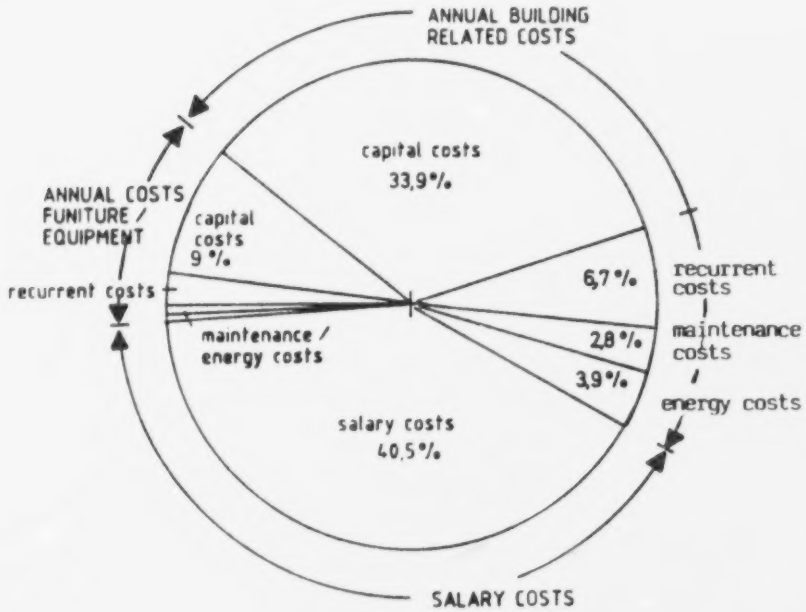
The results differ considerably from what is normally perceived as being the distribution of annual costs for an educational establishment. The high proportion represented by building-related costs shows the urgency of making more effective use of building resources.

Even if educational and social considerations should be the main determinant in assessing space requirements and space use, it is evident that it is only by taking a realistic economic approach that improvements can be achieved.

While many consider that the economic aspects are mainly the realm of elected representatives and central or local government officials, economic considerations need to permeate the whole briefing, design, construction/ remodelling and evaluation process. They are thus a matter which should be the concern of all interested parties.

For this to become a reality, there is a need for clearer and better information to be assembled and presented in a form understandable to all. It is only too frequent that the planning, briefing and design process is cut up in distinct, separate slices with decisions for each made by different

Figure 5 **Distribution of annual costs by items**



Source: Robert Solvang and Sigbjørn Strømmen "Arealdata for skolebygg, ett analyseredskap". Skriftserie for yrkespedagogik, Publikasjon 29B, Statens Yrkespedagogiske Høgskole, Oslo.

people. For example, planning decisions, including those on finance, are taken by elected representatives; the briefing is the role of 'programmers' or officials, in the best of cases in consultation with headteachers and teachers; and the design is considered the sole realm of the architect. While this picture is somewhat exaggerated, it was clear from the statements made by all seminar groups that unless the process is changed to create a close working partnership of all concerned throughout these various phases, little progress will be made towards more effective space provision and space use.

Several groups stressed the importance of developing appropriate tools and techniques for effective user participation in the decision process. One problem frequently referred to is the need for developing a 'common language of communication'. This is to a large extent linked to the kind and nature of the information produced and to the way it is collected and presented. A 'common language' does not imply that all need to have the same information in the same form. The distinction made between the strategic, tactical and operational levels of decision-making, referred to in the context of the application of economic appraisal to educational building (8), may well apply also to the various stages of analysis involved in determining space requirements and space use. No information should be 'hidden' but the extent of detail needed at the different levels of the decision process will vary.

To develop a 'common language' is not an easy task. One group suggested the need for an 'interface' team which, as its name indicates, would facilitate communication between users and architects/building specialists. Its role would be to interpret the language of each and make explicit the economic consequences of alternative courses of action in terms of both capital and recurrent costs.

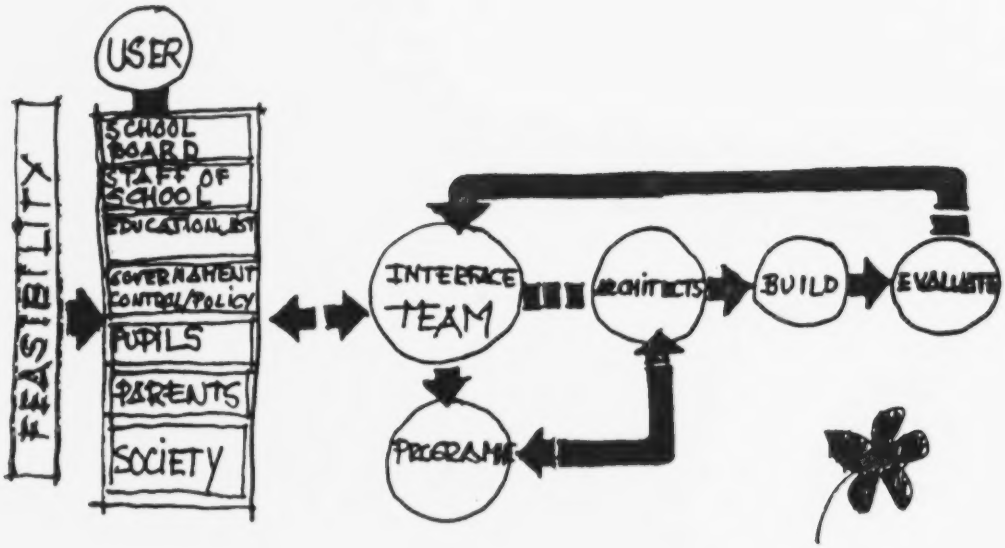
Such a team which is more than a consultancy firm or group of officials asked to prepare a programme or a brief, must be involved from the initial stages of determining the feasibility of a project or a series of interrelated projects through implementation to evaluation. To be effective the 'interface' team which must be inter-disciplinary, needs to be able to accumulate experience and cannot therefore be set up on an ad-hoc basis. It is also important that there is a feedback from such teams and possibly also a direct input from them into further studies and research. Figure 6 drawn from one of the group presentations illustrates this process.

The seminar as a whole insisted that whatever the project - new building or remodelling - much more time and effort should be devoted to the programming or briefing stage. This is the stage which by and large will determine the nature of the end product. (See Figure 7). A fruitful dialogue in a close working partnership between all interests involved cannot take place in a matter of weeks as is now generally the case.

Developing a 'common language' also depends on greater emphasis being put on the relationship between educational activities and space in the initial and continuous training of teachers. Likewise, headteachers should be given particular training in the management of premises and ways of optimising building resources.

While everyone agreed that architects must bring their particular dimension to a project, there were a number of participants, including several of the profession, who argued that a change of attitude was needed also on the

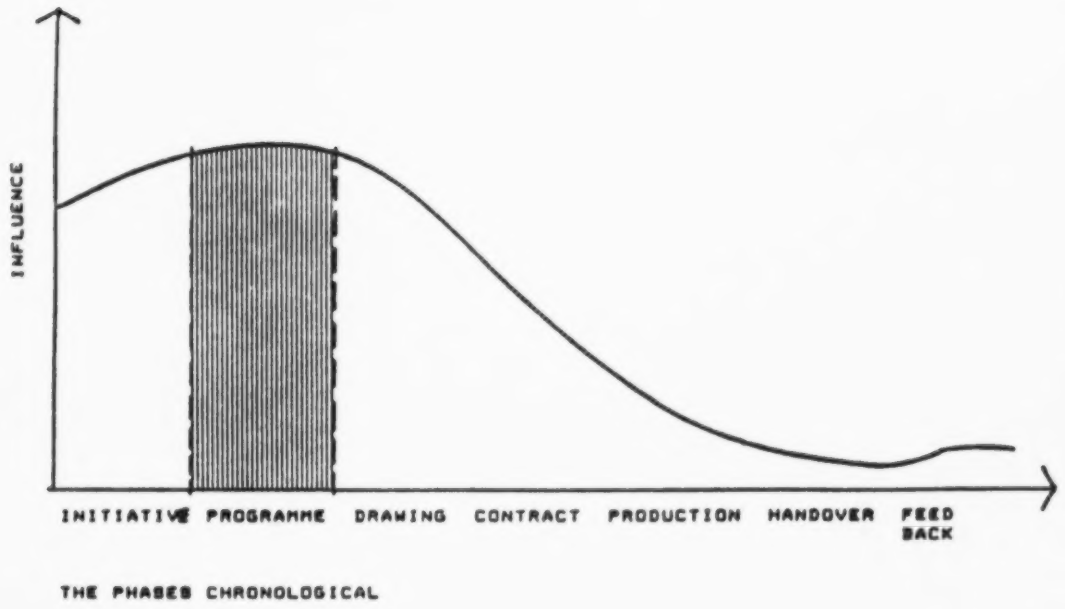
Figure 6 Role of 'interface' team in the process



part of architects. Because of lack of knowledge among users about the implications of architectural solutions, the architect often tends to play too dominant a role and impose his own answers. These might well have been very different if the conditions for a true dialogue had existed.

Participants finally stressed the importance of investing in relevant, as opposed to abstract, research. They expressed their appreciation of the Norwegian research study as an example of practical, useful work. In most PEB countries a large number of local authorities are responsible for developing and maintaining an up-to-date stock of educational buildings. This results in much duplication of effort in the development of the necessary tools, techniques and approaches. The seminar believed therefore that wherever central units for R & D and the dissemination of information existed they would need to be strengthened. If they did not exist, they would need to be created. Likewise, it insisted that such sharing of experience and pooling of research efforts were a necessity not only within individual countries but also between countries.

Figure 7 The influence and importance of the briefing stage



IN CONCLUSION

A number of key words or sentences seem to be the best way of summing up the main conclusions of the seminar:

i) In identifying need:

- analyse teaching/learning as well as the social role of the school in the community in terms of activities rather than by types of space;
- consider sequence of activities;
- relate activities to group size;
- leave more scope for flexibility in time-tabling;
- whenever possible allow for the integration of theoretical and practical activities.

ii) In matching provision to identified need:

- involve teachers in establishing sizes of individual activity areas, analysing overlaps and making necessary regroupings;
- prepare furniture and equipment layouts for individual areas;

- ensure adherence to health and safety regulations;

- consider the economic consequences of alternative courses of action;

- provide flexibility through the provision of a variety of spaces and adaptability, e.g. through the provision of services in ceilings and floors or on external perimeter walls.

iii) In assessing the most effective utilisation of space:

- use a formula based on density of occupation and frequency of use to arrive at a target utilisation rate for individual spaces;

- apply this formula to reconsider the use of existing spaces or assess the demand for extension or new building;

- develop, where necessary and feasible, computer assisted techniques for such assessments;

- improve organisation, management and time-tabling to eliminate mismatch between spaces and activities and to avoid peaks and troughs in the use of individual spaces;

- reconsider the organisation of the school day, school week and school year to enable unsatisfied or new demands to be met;

- look at the possibilities and economic advantages of extended network co-operation and community use of school facilities.

iv) In seeking to develop a more effective process for the determination of space requirements and space use:

- define who are all the interested parties;

- increase the time devoted to the programming or briefing stage, essential in determining the nature of the end product;

- consider what information should be assembled and in what form it should be presented at the strategic, tactical and operational levels of decision-making;

- make economic considerations the concern of everyone involved;

- develop new tools and techniques to improve user participation in the decision process and to promote a 'common language of communication';

- consider the usefulness of 'interface' teams in the briefing, design, construction or remodelling and evaluation process;

- develop course modules for the initial and continuous training of teachers in activity/space relationships and the use of space;

- give particular attention to the training of headteachers in the management of premises and ways of optimising building resources;

- facilitate a change of attitude on the part of architects through improved procedures allowing a true dialogue with the users;

- ensure the development and strengthening of central units for research, development and dissemination of information, and sustain the sharing of experience and pooling of efforts between countries.

The seminar was clear that the above is a 'table d'hôte' meal not an 'à la carte' menu. It is not a question of choosing among the conclusions only those which seem most appealing. The difficulty of the task ahead is to develop and apply a coherent set of methods and procedures which together will lead to more effective use of building resources. The latter is a must if countries are to be in a position to make the improvements in the teaching/learning environment and working conditions of their educational institutions that are required to meet the needs of the 21st century.

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ASSESSING SPACE REQUIREMENTS AND SPACE USE IN EDUCATIONAL BUILDINGS.

by

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This is a summary of a report from a research project: "Better space- and ressource- use in school buildings." This project is carried out for the Ministry of Church and Education.

The report describes procedures and aids used throughout the programming phase of rebuilding and extending an existing upper secondary school.

The purpose of having a specific building project has been to try out different ideas on how to carry out the briefing for a school building and how to transform the knowledge of school users to relevant data in a building programme.

To begin with, a few important guidelines for the project were drawn up:

- THE SCHOOL STAFF SHOULD BE INVOLVED ACTIVELY AND SYSTEMATICALLY IN THE PLANNING
- THE ORGANISING OF THE TEACHING, AND THE ACTIVITIES OF THE TEACHERS AND THE STUDENTS DURING LESSONS SHOULD BE DESCRIBED.
- THE SPACE REQUIREMENT OF ANY TEACHING/LEARNING ACTIVITY SHOULD BE DOCUMENTED.
- THE USE FREQUENCY OF ALL TEACHING AREAS SHOULD BE DOCUMENTED.

1. THE BRIEFING - THE BUILDING PROGRAMME

We have focused on the BRIEFING PROCESS and the BUILDING PROGRAMME because the foundation for a good school building which functions well is laid when the programme for the school building is worked out. The quality and thoroughness of the work of making a programme will to a high degree decide one's return for one's investments. We venture to make the following assertions:

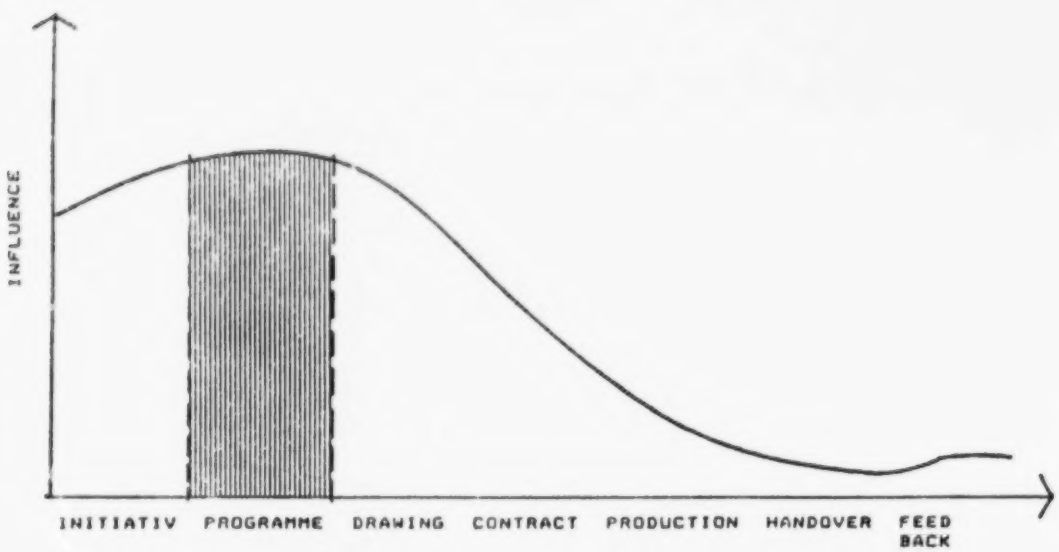
- A school building will seldom be a good teaching tool if the physical conditions for teaching are not discussed during the briefing and described in the building programme for the school.

- It is highly unlikely that a school building will be a flexible tool, able to be quickly rearranged and adapted to different purposes, if demands for flexibility are not specifically expressed in the building programme for the school.

We have however the impression that the preparation of the school building programme is the weakest link in the whole process. After having gone through a large number of reports on new schools, we are left with the impression that important elements are missing in the briefing. The briefings are often "unbalanced". The number of pupil places are usually well documented and thoroughly discussed. In the same way the teaching requirements and the number of courses offered are estimated and documented. It seldom happens that equal importance is attached to the space requirements and the space uses of the school building itself. It is usually regarded sufficient to set up a space programme in which functions, activities, space requirement and utilisation are not adequately documented. The aims and methods of teaching and learning, and the plan for the organising of teaching, are seldom or never described in such a way that the descriptions may be used in deciding the dimensions, the form and the use of the building.

It appears that it is not generally understood that a well- planned building programme is highly important, both for the costs and the quality of the building for teaching. One of the signs pointing to this is that the time allowed to work out the building programme is, as a rule, far too short. When the decision to undertake a building project is taken, working out a building programme is often a rush job. This is unfortunate, because it is in this phase that there is the greatest possibility of influencing the result.

Figure 1 shows the actual phase and its importance.



THE PHASES CHRONOLOGICAL

2 CHOICE OF METHOD

We found it practical to work on a specific building project. By participating in and leading the work with the programme, we have tried to describe the planning process and have developed "tools" and aids to work out the programme. By using these in consultation with the users, we have made a building programme according to the guidelines drawn up beforehand. In the beginning only a few but essential guidelines were staked out. Otherwise we chose to leave our options open, partly because two processes were involved:

1) A process geared to developing the programme as a product.

and

2) A process for learning, maturing and idea-forming. This had to run parallel to the first process.

We were of the opinion that a planning process would give the participants the opportunity to unfold and develop their ideas. In order to make this possible, the planning process had to take a certain period of time. The participants would meet relatively unprepared, because they were otherwise engaged in their daily work. If the users of the school were to have a real say in the design of their own place of work, by using the knowledge they possess about the use of the school, and have this translated into relevant facts in the building programme, they had to be informed and prepared for the task by us. Therefore by taking part in the planning we have also given information on the investments and running costs of school buildings, and the way in which the physical design of the buildings may influence their uses, seen from an organising and teaching point of view.

3 CHOICE OF BUILDING PROJECT

A number of different considerations decided the choice of a building project. It was important that the project should be representative for future school building development. Therefore it was undesirable to plan the programme for a new school. Over the next ten to fifteen years more attention will be paid to existing school buildings. In our opinion these will be extended and rebuilt to a much greater degree than up till now. Existing school buildings must be regarded as a "tool" to be used in the continuous process of adjustment to the new educational needs that changes in working conditions, structure and society lead to.

Another reason for choosing such a project was that we had certain ideas about a planning process in which the users played an active and systematic part. At an existing school there was already employed staff. The staff would have ownership interests in the problems to be discussed and it would be in their own interests to reach the best possible solutions. We assumed that the process of learning and developing that would take place in consulting with

the school users would be of importance for the teaching, and the running of the school in the future.
Our choice fell on an upper secondary school with vocational and technical studies. At such schools the space requirement is greatest, but at the same time the least planning has been done.

4 GUIDELINES FOR THE PLANNING OF THE PROGRAMME

4.1 MAIN POINTS

At an early stage certain guidelines for the work were drawn up, and we decided what was to be covered in the programme and how it was to be divided. These decisions governed the whole process of the planning of the programme. The following were decided on:

1) The school users must be drawn actively and systematically into the planning.

2) The programme for the school is to be divided into 3 sections:
   1. A MAIN PROGRAMME
   2. A DEPARTMENT PROGRAMME
   3. An AREA PROGRAMME

3) The dimensions and use of the school are to be decided from the descriptions of activities and the proximity requirement.

4) The space requirement is to be documented using scale sketches of activity areas.

4) The use frequency of every single teaching area is to be "made apparent".

COMMENTS ON POINT 1):
The range of users is comprehensive. It was desirable to have the widest possible representation, but the time allowed for the project prevented this. When it first became necessary to limit the user representation, there were several reasons for choosing the school staff:

- There are legal grounds for their participation in the Working Environment Act. This act gives the employees the right to participate in decisions regarding the design or alteration of the occupational environment in their own place of work.

- The school staff, i.e. teachers, administrative staff and other employees have knowledge and experience that are essential for the briefing process. This category of users had to participate so that the demands made for the building programme could be met.

COMMENTS ON POINT 2):
The purpose of dividing the programme into three sections - a main programme, a department programme and an area programme is to form a programme pattern that makes it absolutely necessary to discuss the premisses for the design, the dimensions and the use of the areas on these three levels before the area programme is worked out.

Fig.2 shows, in a simplified and schematic way, important features that have to be decided on all levels.
Fig. 2

	MAIN PROGRAMME	DEPARTMENT PROGRAMME	AREA PROGRAMME
ACTIVITIES	SCHOOL STRUCTURE	ACTIVITIES FROM TEACHING PLANS AND STATEMENTS OF USERS	DESCRIPTION OF INDIVIDUAL ACTIVITIES
SPACE-REQUIREMENTS	TOTAL ESTIMATE BASED ON m^2/STUDENT	PLACING TOGETHER OF DEPARTMENT AREAS	DOCUMENTED SPACE REQUIREMENT FOR EACH ACTIVITY
PROXIMITY REQUIREM.	BETWEEN SCHOOL DEPARTMENTS	BETWEEN DIFFERENT COURSES IN THE DEPARTMENT	BETWEEN DIFFERENT ACTIVITY AREAS AND BETWEEN ACTIVITIES IN THE ROOM
FREQUENCY OF USE	DECISIONS ON AVERAGE DEGREE OF UTILISATION	DISCUSSION ABOUT GENERAL USE OF AREAS AND EQUIPMENT	DOCUMENTING OF DEGREE OF UTILISATION FOR EACH SPECIFIC ACTIVITY

The term "room programme" is usually used in Norway, but we have deliberately changed this term to the concept "area programme" because those working on the plan may be less tied to fixed room solutions. An area programme may lead to many new space combinations and increased joint and shared use of teaching area.

COMMENTS ON POINT 3):
The area provisions are to be based on analyses and not on average measurements taken on existing school buildings. There are several reasons for this:

- The measurements as a rule come from teaching rooms suited to traditional ways of organising teaching. Analyses may lead to new methods of organisation that increase the opportunity for cooperation and joint and shared use of the areas.

- The space requirement changes rapidly, especially in the vocational education. The teaching/learning aids and the equipments are not static sizes. Using old space requirements may result in teaching areas that are not favourable to new educational needs.

5 BRIEFING PROCESS - PROCEDURE

5.1 MEETINGS

In the initial phase a number of meetings was held where all the staff were present. They were informed about the project, the underlying ideas and intentions, and the opportunities and commitments that might be the result for the school and the staff.

The staff also expressed their opinions, at the same time as they gave their support to the project. This approval was important.

5.2 DOCUMENTATION/INFORMATION

Before the three briefing phases - the main programme, the department programme and the area programme - a written briefing was given to the staff on what should be planned, and which questions we thought it necessary to discuss.

5.3 A COMMON PLATFORM PLANNERS/USERS

In the guidelines, which are already given an account of, it is assumed there will be interplay between the planners and users. It was important to have a relationsship of trust and a platform for talking and exchanging ideas. We thought that the starting point and the platform must be the knowledge and experience the staff had in their daily work at scool, and that in the planning stage it would be possible to enlarge the platform. Everyone got time and opportunity to describe the existing facilities and working conditions he/she had experienced there. This was a good starting point for discussing ideas and approaching the problems. Everyone "played a home game".

5.4 INFORMATION, MOTIVATION, AWARENESS AND IDEA-FORMING.

A rebuilt and extended school building should present new possibilities. Therefore questions were often asked on whether the existing conditions offered the best solution.

- What changes had taken place in the subject ?
- How should the teaching be organised ?
- Should one try to integrate theoretical and practical work to a greater degree than was possible before ?
- Should one arrange for closer cooperation between teachers ?
- Could increased cooperation make the use of more joint and shared teaching areas possible ?
- What about more projects in the teaching ?
- Could construction features that influence for instance order, cleaning and maintenance affect the attitudes of the pupils ?
- Was it desirable to cooperate more closely with local trade and industry ?

By asking such questions, mixed with a number of provocative statements, new views and thoughts were thrown into the debate. At times people became very involved in the debate. This, and the knowledge that it was a question of improving the conditions at their own place of work, gave the motivation needed for a concentrated extra effort.

The participants discussed the organising of the teaching and possible solutions for the building. We intended putting into the programme the agreed objectives. Then the objectives would decide the building, instead of the building "deciding" the objectives.

6 AIDS/"TOOLS"

In the three briefing phases we required to use different aids/ "tools" suitable for drawing out the basic material for deciding space requirement regarding dimensions, design and use. We have found it practical to describe the aids/"tools" in the following order:

6.1 ACTIVITIES/ACTIVITY AREAS
6.2 SPACE REQUIREMENT
6.3 PROXIMITY REQUIREMENT
6.4 SPACE UTILISATION/JOINT AND SHARED USE
6.5 "VISUALISING" USE FREQUENCY AND JOINT AND SHARED USE OF AREAS.

6.1 ACTIVITIES/ACTIVITY AREAS

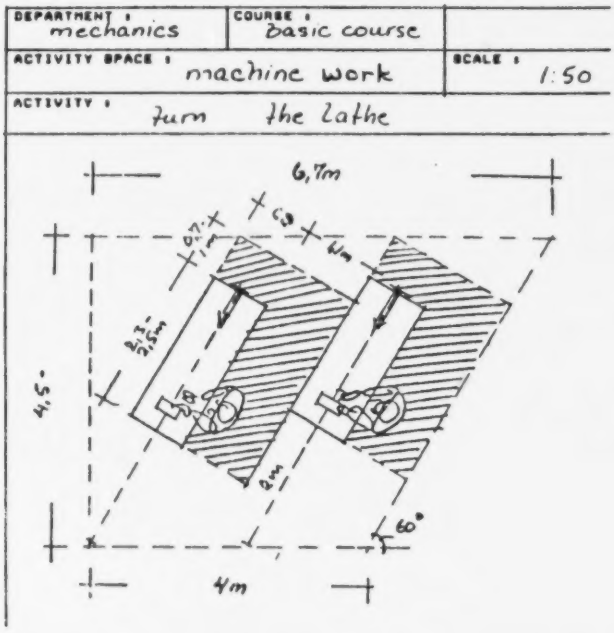
We have chosen to avoid the use of traditional descriptions of types of room e.g. workshop, theory room, room for group activities, laboratory etc. As a rule such rooms are given dimensions according to the dimensions of corresponding rooms at other schools, and according to the traditional opinion of how such rooms should be used. This can be unfortunate because the dimensions of the rooms seldom are well enough documented, and because the description of rooms easily leads to the rooms being "tailor made" for a particular use. So the rooms may easily have a low degree of utilisation. In order to attain a better method of deciding the measurements and use of teaching areas, the statements in the curriculum on OBJECTIVES, LIST OF SUBJECTS, and TEACHING METHODS were used to find out which activities were essential in the teaching/learning situation. In addition, in the briefing process the teachers got the opportunity to discuss which activities would affect the dimensions most. In all, this has given us the facts necessary to use the term ACTIVITY AREA insted of ROOM. Fig. 3 shows examples of how the traditional descriptions of types of room have been replaced.

Fig. 3

TRADITIONAL NAME OF ROOM	IS CHANGED TO:	ACTIVITY AREAS
WORKSHOP (FOR MACHINERY AND MECHANICS)	- -	AREA FOR PRACTICAL TRAINING IN: 1) USE OF TOOLS 2) ASSEMBLY WORK 3) MACHINE WORK 4) MECHANICS OF MATERIALS AND HEAT TREATMENT
THEORY ROOM	- -	AREA FOR: 1) LECTURES 2) TEACHER DEMONSTR. 3) INDIVIDUAL WORK 4) GROUP WORK 5) AUDIO-VISUAL EQUIPMENT
ROOM FOR GROUP ACTIVITIES	- -	AREA FOR: 1) GROUP WORK 2) PRIVAT STUDY 3) COMPUTER EQUIPMENT
STOREROOM	- -	AREA FOR STORING: 1) ---------- 2) ---------- 3) ----------

6.2 SPACE REQUIREMENT

There is a great variety of activities in the many different branches of studies and courses in the upper secondary school in Norway. No one knows about all the subjects. We know that cooking is done in Cookery, and welding is done in Metalwork. Similary many people know a little about most of the more than 100 different courses offered in upper secondary school. Such knowledge is however of little use when space requirment is estimated, and the areas for teaching are given their measurements. Then one has to know about the different activities in the teaching, and here the professional knowledge of the subject teachers is indispensable. Therefore the subject teachers made the scale sketches of the activity areas that would decide the space requirement. The facts contained in these sketches were systematically expressed in the area programme for the school. Fig. 4 shows an example of how the teachers in one department made scale sketches of an activity area. Here the actual teaching equipment and the space requirement round the equipment is in scale.
Fig. 4



THE PLACING TOGETHER OF INDIVIDUAL ACTIVITIES IN ONE ACTIVITY AREA
The users generally handed in a sum of the individual areas with the scale sketches of the individual activities. Perhaps some of them thought that the sum should be expressed in the area programme. This is however too simple. The sketches had to be redrawn, in such a way that they were done more uniformly. Afterwards the different individual activities were overlapped where this was possible.

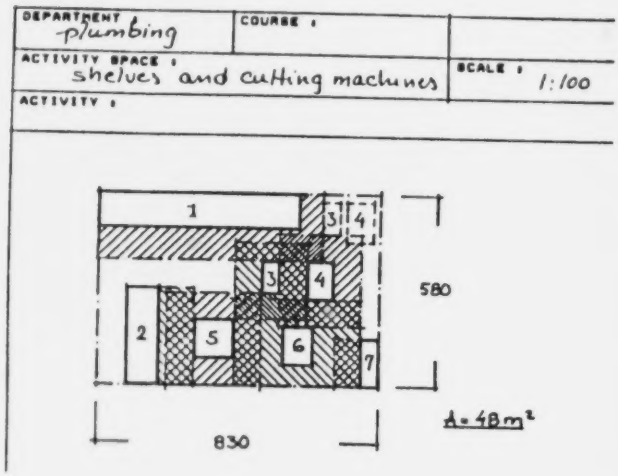
A number of individual activities overlapped; an activity area, shows the real space requirement. Fig. 5 shows a sketch of overlapped individual activities. This is one of the activity areas for plumbers.

Fig. 5

SPACE FOR INDIVIDUAL ACTIVITIES

1	SHELVES FOR PLUMBING PIPES	13.4	m
2	SHELVES FOR STEEL PLATES	6.0	m
3	PIPE SAW	7.4	m
4	THREAD-CUTTING MACHINE	8.5	m
5	SHEET METAL SHEARS	7.8	m
6	VERTICAL DRILL	9.9	m
7	SHELVES FOR DRILLS	2.0	m
	TOTAL AREA:	55.0	m

OVERLAPPED ACTIVITY AREA

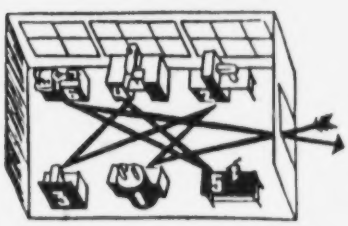


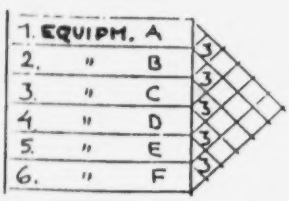
6.3 PROXIMITY/DISTANCE REQUIREMENT

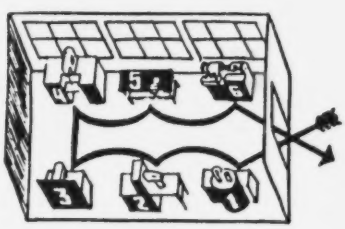
Fig. 2 Chap. 4.1 shows amongst other things how the requirement for proximity or distance may be estimated on different "levels" during the briefing process. As an example, we want to show such handling on all the levels regarding the proximity/distance requirement.

In the area programme (level 3) it is important to estimate the distance/proximity requirement between each individual activity area and between the individual activities. By using such estimates one avoids placing work places, machines and equipment inappropriately, and one probably saves space and utilises space better.

Fig. 6





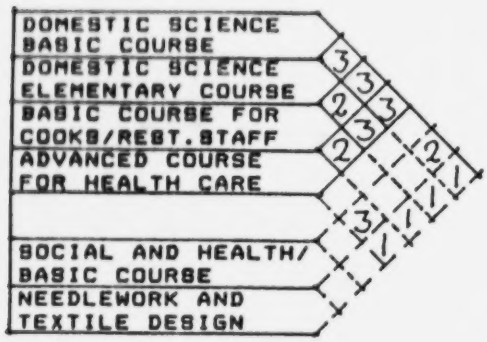


In the department programme (level 2) it is important to estimate the proximity/distance requirement between different courses. By using such estimates one facilitates cooperation between teachers and joint and shared use of space and equipment.

A suitable "tool" for such estimates is the "proximity matrix".

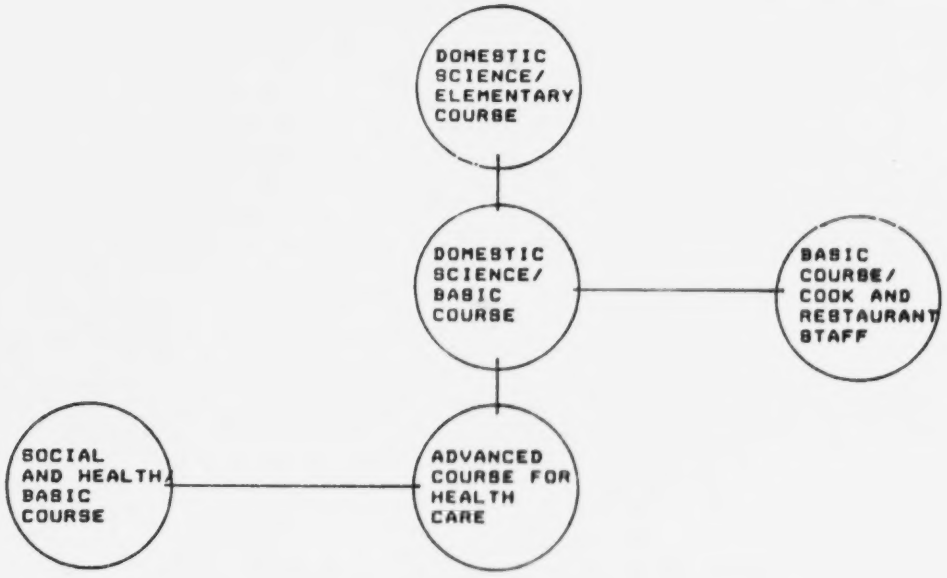
With this one can grade the proximity or distance requirement e.g. with numbers from 1 - 3. At the same time one can give the numbers a positive or negative value, depending on whether one wishes proximity or distance. Fig. 7 shows an example. It is taken from the department programme for Domestic Science.

Fig. 7 "Proximity matrix" level 2


DOMESTIC SCIENCE BASIC COURSE
DOMESTIC SCIENCE ELEMENTARY COURSE
BASIC COURSE FOR COOKS/REST.STAFF
ADVANCED COURSE FOR HEALTH CARE
SOCIAL AND HEALTH/ BASIC COURSE
NEEDLEWORK AND TEXTILE DESIGN

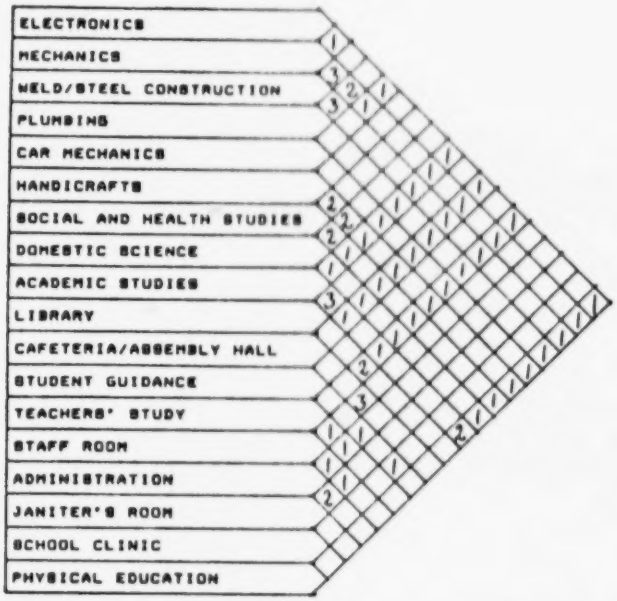
Here the proximity requirement is estimated between inter-departemental and extra - departemental courses.

Fig. 8 shows a "location scheme" for the Domestic Science department. It is based on facts taken from the proximity matrix in Fig. 7. The form may be directly transferred for use in later planning.
Fig. 8


DOMESTIC SCIENCE/ ELEMENTARY COURSE
DOMESTIC SCIENCE/ BASIC COURSE
BASIC COURSE/ COOK AND RESTAURANT STAFF
SOCIAL AND HEALTH BASIC COURSE
ADVANCED COURSE FOR HEALTH CARE

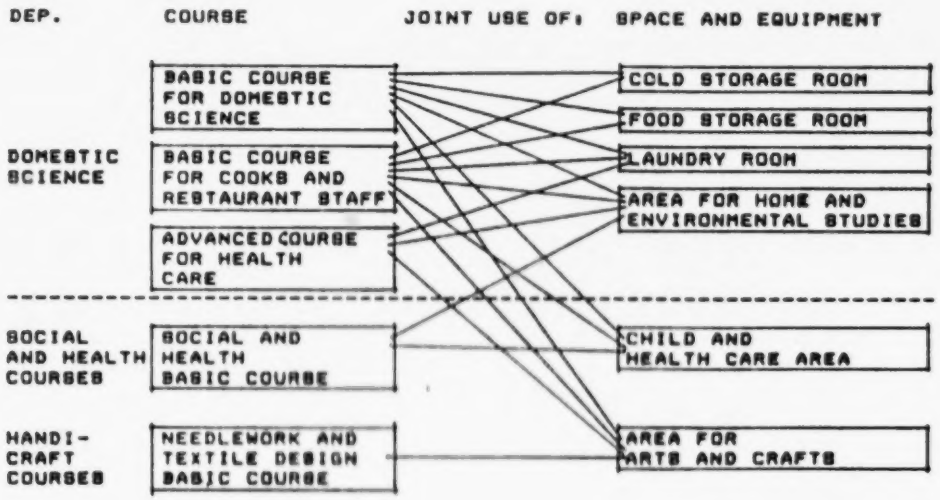
In the main programme (level 1) it is important to estimate the proximity/distance requirement between the departments in the school. Thus one may avoid placing departments, equipment and teachers haphazardly in the areas. One may arrange them so as to

facilitate cooperation between teachers and joint and shared use of space and equipment.
Fig. 9 "Proximity matrix" Level 1



6.4 SPACE UTILISATION/JOINT AND SHARED USE

It is necessary to estimate the possibilities available for joint and shared use of space and equipment. Thus one may achieve a higher use frequency of both areas and equipment. There are many posibilities, and the space-saving may be great. However it requires good intentions and the ability to change traditional ways of organising teaching and cooperation. Therefore it is important that the users get the opportinity to discuss this. An example of a "Joint and shared use form" for the Domestic Science department is shown here.
Fig. 10


DEP.
COURSE
JOINT USE OF: SPACE AND EQUIPMENT
BASIC COURSE FOR DOMESTIC SCIENCE
DOMESTIC SCIENCE
BASIC COURSE FOR COOKS AND RESTAURANT STAFF
ADVANCED COURSE FOR HEALTH CARE
SOCIAL AND HEALTH COURSES
SOCIAL AND HEALTH BASIC COURSE
HANDI-CRAFT COURSES
NEEDLEWORK AND TEXTILE DESIGN BASIC COURSE
COLD STORAGE ROOM
FOOD STORAGE ROOM
LAUNDRY ROOM
AREA FOR HOME AND ENVIRONMENTAL STUDIES
CHILD AND HEALTH CARE AREA
AREA FOR ARTS AND CRAFTS

The resulting form is part of the basis of the space analysis.

It would be impossible to draw up such a form unless the users take an active part. It may therefore be used as an example to show that the users must take an active part in an early stage in the briefing phase if new forms of organisation and cooperation are going to be developed in order to achieve better utilisation of school space.

Teacher collaboration is worthwile, and the analysis the teachers make, when this tool is used, gives them positive impulses. In a way you can "have your cake and eat it". It is tempting to assert the following:

INCREASED TEACHER COOPERATION, DETERMINED BY A DIFFERENT WAY OF ORGANISING TEACHING, MAY LEAD TO BOTH BETTER SPACE UTILISATION AND BETTER TEACHING.

We may find out from appraisals and feed-back if the assertion is true.

6.5 "VISUALISING" USE FREQUENCY AND JOINT AND SHARED USE OF AREAS.

The utilisation of an area is determined by its "use frequency" and "occupation".

- E.g. an area may be defined as having a use frequency of 100 % if it is in use 40 periods a week throughout the whole school year.
- In the same way a room, which is planned for 30 people, has an occupation of 100 %, when 30 people are in it.

The utilisation of an area, expressed as a percentage, is the product of its use frequency and its occupation.

UTILISATION (%) = USE FREQUENCY (%) X OCCUPATION (%)

In section 4.1 we drew up guidelines for the briefing under 5 main points. Under point 5 it says:

> "The use frequency for every teaching area has to be "made apparent".

An obvious question could be: why did we not attempt to visualise the occupation; why only the use frequency ?

The occupation would be difficult to quantify before the school is in use. We assume that the occupation will be high and relatively constant in the most common teaching areas for many years to come. On the other hand, where a number of other areas are concerned e.g. the assembly hall, cafeteria, library, gymnasium etc. the occupation may be more uncertain. The use frequency for the teaching areas may however be quantified and visualised. Facts may be found in the curriculum. The area divisions and locations may be systemised according to departments, and the period load for each individual area may be estimated. To do this we have worked out a "loading scheme". We gained experience with this during the briefing process. When it was obvious that an area was poorly utilised, the users were most willing to discuss new methods of organising the teaching, in order to make it possible to utilise the area better.

Fig. 11 shows an example of such a scheme. It is taken from the department of domestic science. In the scheme can be found the period load and use frequency for all areas in the department.

Fig. 11

DEPARTMENT: domestic science

TEACHING AREAS \ COURSES		domestic science basic course	basic course for cooks and restaurant staff	health care advanced course	social and health. basic course	needlework/ textile design basic course	TOTAL	THEORETICAL ROOM REQUIR. n = p.w/40	PRACTICAL ROOM REQUIR.	FREQUENCY OF USE %	SURPLUS PERIODS p.w.
		TOTAL PERIODS PER WEEK			PERIOD PER. WEEK FROM OTHER DEPARTMENTS						
TEACHING AREA IN OTHER DEPARTMENTS											
AREA FOR PRACTICAL TRAINING	cookery	14+14		9	4		41	1,025	1	102,5	+1
	cookery		7+9 6+3				25	0,625	1	62,5	15
	home and environmental studies	5+5	1+0	3	8	1	35	0,875	1	87,5	5
	social and health studies	4+4	1+1	2							
AREA FOR VOCATIONAL THEORY		4+4	(6+3)				8	0,2	1	20	32
				13			13	0,325	1	32,5	27
AREA FOR ACADEMIC STUDIES		2+2	11+11	2			28				
AREA FOR PHYSICAL TRAINING		2+2	3+2	2			11				
OPTIONAL SUBJECT		4+4	5+5	4			22				
	TOTAL	70	65	35	12	1	183				

ANNEX B

AREA STANDARDS AND THE UTILISATION OF TEACHING SPACE

A Brief Summary of Recent Work by the DES, London

by

Jeremy Wilson

AREA STANDARDS

The Department of Education and Science publishes guidance on methods of relating curriculum needs to accommodation requirements (1). Most building projects involve work to existing buildings, rather than comprising entirely new schools or colleges. However, even when considering an existing building, it is still necessary to establish a "model" statement of curriculum needs and accommodation requirements. This "model" should take account, as far as possible, of future changes in the curriculum. The "model" can then be compared with the existing accommodation, and thus a basis exists for making decisions on the extent and nature of building work required.

CONSTRUCTING A "MODEL"

Number of Teaching Spaces

The range of types of teaching space needs to be categorised by subject area or activity. The number of teaching spaces required of each type can then be calculated. A statement of educational requirements must be made in such a way that the curriculum intentions can be quantified. It must be possible to calculate the amount of students' time spent in particular subject areas and the related staff deployment. The constraints imposed by examinations should also be recognised. The methodology also depends on two factors:

a) that there will be a timetable with regular periods of time to facilitate the organisation of the curriculum and

b) that there is an intention to exercise management control in the use of space.

To this end the method provides a concept of "reasonable use" of space and gives guidance upon quantifying reasonable use.

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SIZE OF TEACHING SPACES

The size of the various types of teaching space will vary according to two factors:

i) The maximum group size that is to be accommodated. This is, to some extent, a subjective judgement. If the room size distribution relates very closely to the group size distribution (e.g. a "tight fit"), the flexibility to respond to future changes may be prejudiced;

ii) The area standards applying to the various activities/subjects. Judgements are best based on observed practice, taking into account teaching methods, furniture and equipment layout.

A computer program (2) is being developed which combines the necessary variables and calculates the results of a given data input. The input data can be readily amended, allowing a range of possibilities to be quickly explored.

UTILISATION OF TEACHING SPACES

Improvements by Design

Decisions can be taken at the design/briefing stage in order to improve the likely utilisation of teaching accommodation including:

a) Surrounding a department which requires an identifiable core or nucleus by spaces that are shared. This allows the department to expand or contract by using these shared spaces for more or less time;

b) Avoiding the use of schedules of accommodation consisting of rooms tailor made to a single activity. Rooms should be grouped into the broadest possible categories and specialist functions should be provided for by furniture and services that can be altered easily;

c) Making sure that buildings contain an appropriate mix of room sizes so that changes in curriculum and teaching methods can be accommodated principally by timetabling.

Improvements by Management

Those measures falling within the purview of management seem to be:

a) To place as much accommodation as possible in a common pool for timetabling, to be shared between departments or, in large institutions where distances are great, between groups of departments;

b) To classify rooms by their basic size, shape and facilities so that all potential uses are revealed;

c) To examine carefully the customs that have grown up in the timetabling of events and the use of rooms in order to see which are essential and which may be altered with advantage;

d) To spread scheduled activities as far as possible throughout the day, week, term and year so that unnecessary peaking is avoided, bearing in mind that the hours of opening of non-teaching areas such as cafeterias may have a considerable effect on the timetable.

NOTES ON THE PAGODA PROGRAMME

INTRODUCTION

The objective of the PAGODA programme is to facilitate the prediction of space requirements in secondary schools (a calculation of the main statutory requirements for all schools, including minimum teaching area, is also included). PAGODA is intended to be easy to use and to allow a variety of options, based on different assumptions, to be quickly considered. This is particularly relevant to the consideration of possible future needs, and how a a building might be capable of responding to their unpredictable nature. Calculations performed during the operation of the programme are based on Design Note 34, but include additional refinements (DN 34 is likely to be revised accordingly).

INPUT DATA

Size of school.

Age range.

Number of teachers.

Contact ratio (proportion of the teachers' time spent actually teaching).

Curriculum. Subject areas (or activities) expressed by percentage of pupils' timetabled time. A maximum of 17 subject areas can be accommodated in the programme.

Group size. Target maximum group size for each subject/activity.

Cut-off frequency. Maximum allowable frequency of use before an extra teaching space is required.

Area standards. Maximum and minimum areas per workspace for each subject/activity (teaching spaces are therefore defined by subject area/activity).

OUTPUT DATA

For each subject/activity:

Number of teaching spaces required.

Average group size (as calculated).

Frequency of use of each type of teaching space (as calculated).

Number of workplaces required.

Teaching area required for the calculated workplaces.

HARDWARE SPECIFICATION

This comprises an Apple IIE computer with twin disc drives and interface card. The Apple 80 column text card is essential (normal or extended). The programme was compiled on a computer also fitted with Apple super serial card (thought not to be essential) and is designed to run with a 10 inch Apple Image Writer (other printers should not cause problems).

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1. "Area Guidelines for Sixth Form, Tertiary and NAFE Colleges", *Design Note 33*, Department of Education and Science, London 1983, 30 pp (ISSN 0141-2825).

   "Area Guidelines for Secondary Schools", *Design Note 34*, Deaprtment of Education and Science, London 1983, 20 pp (ISSN 0141-2825).

   "Area Guidelines for Advanced Further Education Institutions", *Design Note 44*, Department of Education and Science, London 1985, 55 pp (ISSN 0141-2825)

2. PAGODA: DES Commissioned Research Project with the Polytechnic of Central London.

ANNEX C

LIST OF DOCUMENTS PRESENTED AND SELECT BIBLIOGRAPHY

A. DOCUMENTS PRESENTED

These documents are in English unless otherwise stated and are available from the PEB Secretariat.

Background paper

"Assessing Space Requirements and Space Use in Educational Buildings" by Robert Solvang and Sigbjørn Strømmen, 13 pp (available also in French - see Annex A).

Country contributions

Belgium

"Procédures en vigueur pour déterminer les surfaces nécessaires à l'enseignement des 13 à 19 ans et maximalisation de l'utilisation des installations existantes en Belgique (d'expression néerlandaise)" by the Gebouwenfonds voor de Rijksscholen, 6 pp (in French but available also in English).

Finland

"Current procedures for determining area standards", note by the National Board of Education, 4 pp.

"Vocational Education in Finland", a brochure by the National Board of Vocational Education, 11 pp.

France

"Note relative aux procédures en vigueur en France pour la programmation des établissements" by Alexandre Bertrand du Service technique de l'Education nationale, 4 pp (in French but available also in English).

"Incidence de la décentralisation sur la programmation des investissements dans les constructions scolaires" by Jean Nermond, Ingénieur de l'Equipement, Rectorat de Montpellier, 5 pp (in French).

Greece

"Educational Space Requirements and the Effective Use of Resources in Greece, note by the Ministry of Education and Religion, 14 pp.

Netherlands

"A survey of the work done by the ICS in the field of standardizing space for secondary education in the Netherlands" by Gerard Fränzel, 3 pp.

Portugal

Note sur la programmation des espaces et l'organisation administrative actuelle, 4 pp (in French but available also in English).

Spain

"Planning Methodology of Educational Spaces" by Z. Gonzalez and F. G. de Paredes of the Central Board of School Buildings and Facilities, 7 pp.

Sweden

"Current procedures in Sweden for determining area standards for the 13-19 age group and effective use of existing accommodation" note by Thomas Landherr, Swedish National Board of Education, 1 pp.

"User Participation in the Initial Stage of the Process of Rebuilding and Extending Upper Secondary Schools" by Harriet Björk, Deputy Director of Education, Helsingborg, 3 pp.

Switzerland

"Définition des besoins en surfaces et équipements pour l'enseignement secondaire" par Eric Biéler, Service technique du Département de l'Instruction publique, Genève, 4 pp (in French but available also in English).

Turkey

"Space Requirements of Educational Buildings in Turkey (13-19 year groups)", by Yilmaz Topkara and Gülçin Özden of the Ministry of Public Works and Settlement, 7 pp.

United Kingdom

"Area Standards and the Utilisation of Teaching Space", 2 pp, and "Notes on the Pagoda Program", 1 pp, by Jeremy Wilson of the Department of Education and Science - see Annex B.

B. SELECT BIBLIOGRAPHY

Published in English unless otherwise stated

France

Guide pour l'élaboration du programme technique de construction des collèges, Direction des Equipements et des Constructions, Ministère de l'Education nationale, Paris 1982, Imprimerie nationale no. 2061 950 1 (37 p.).

Guide pour l'élaboration du programme technique de construction des lycées, Direction des Equipements et des Constructions, ministère de l'Education nationale, Paris 1982, Imprimerie nationale no. 2064358 I 40 (79p.).

Norway

Robert Solvang and Sigbjørn Strømmen, "Dokumentasjon av arealbehov og arealbruk ved planlegging av skolebygg", *Skriftserie for yrkespedagogikk*, Publikasjon 23B, January 1986, 23 pp (in Norwegian but summarised in Annex A to the present report).

Robert Solvang and Sigbjørn Strømmen, "Arealdata for skolebygg, et analysredskap", *Skriftserie for yrkespedagogikk*, Publikasjon 29 B, 1987, 26 pp plus annexes (in Norwegian).

Robert Solvang and Sigbjørn Strømmen, "Prosjekt: Bedre areal-og ressursanvendelse i skolebygg - Sluttrapport", *Skriftserie for yrkespedagogikk*, Publikasjon 30 B, January 1988, 81 pp (in Norwegian, includes revised versions of the two interim reports Nos. 23B and 29B).

Sweden

Skolhus för gymnasieskolan, a review by the National Board of Education of 18 upper secondary schools built or converted between 1976 and 1982, 91 pp (in Swedish but with a summary in English and richly illustrated with plans and photographs, Liber Utbildningsförlaget (ISBN-91-40-70915-9).

United Kingdom

"Space Utilization in Universities and Polytechnics", *Design Note 12*, Department of Education and Science and University Grants Committee, London 1974, 27 pp.

"Area Guidelines for Sixth Form, Tertiary and NAFE Colleges", *Design Note 33*, Department of Education and Science, London 1983, 20 pp (ISSN 0141-2825).

"Area Guidelines for Secondary Schools", *Design Note 34*, Department of Education and Science, London 1983, 20 pp (ISSN 0141-2825).

"Accommodation for the New Training Courses", *Design Note 35*, Department of Education and Science, London 1983, 28 pp (ISSN 0141-2825).

"Assessing the Capacity of Further Education Buildings", *Design Note 37*, Department of Education and Science, London 1984, 15 pp (ISSN 0141-2825).

"Area Guidelines for Advanced Further Education Institutions", *Design Note 44*, Department of Education and Science, London 1985, 55 pp (ISSN-0141-2825).

"Assessing the Capacity of Public Sector Higher Education Buildings", *Design Note 45*, Department of Education and Science, London 1985, 16 pp (ISSN 0141-2825).